Human-in-the-Loop Integrated Life Support Systems Ground Testing

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Human exploration missions beyond low earth orbit will be long duration with abort scenarios of days to months. This necessitates provisioning the crew with all the things they will need to sustain themselves while carrying out mission objectives. Systems engineering and integration is critical to the point where extensive integrated testing of life support systems on the ground is required to identify and mitigate risks. Ground test facilities (human-rated altitude chamber) at the Johnson Space Center are being readied to integrate all the systems for a mission along with a human test crew. The relevant environment will include deep space habitat human accommodations, sealed atmosphere of 8 psi total pressure and 32% oxygen concentration, life support systems (food, air, water), communications, crew accommodations, medical, EVA, tools, etc. Testing periods will approximate those of the expected missions (such as a near Earth asteroid, Earth-Moon L2 or L1, the moon). This type of integrated testing is needed for research and technology development as well as later during the mission design, development, test, and evaluation (DDT&E) phases of an approved program. Testing will evolve to be carried out at the mission level – “fly the mission on the ground”. Mission testing will also serve to inform the public and provide the opportunity for active participation by international partners.